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Materiel Test Procedure 4-3-502  
U. S. Army Artillery BoardU. S. ARMY TEST AND EVALUATION COMMAND  
COMMON SERVICE TEST PROCEDURE

## AMMUNITION FUNCTIONING AND RELIABILITY

1. OBJECTIVE

The purpose of this Materiel Test Procedure (MTP) is to describe methods for observing and recording ammunition functioning and to determine overall reliability required by the Qualitative Materiel Requirement (QMR), Small Development (SDR), or Technical Characteristics (TC).

2. BACKGROUND

Prior to issuing ammunition for actual combat use, it is necessary to assure a very low incidence of poor performance, i.e. misfiring, failure to function on impact, or inaccuracy. In nearly all ammunition service testing, the number of rounds that can be used to gain a large volume of information is limited. Accuracy and precision must be determined, ballistic match must be evaluated, direct fire testing must be conducted, and ammunition-crew and ammunition-weapon compatibility must be investigated.

Concurrent with the above testing, some degree of reliability for the test item must be determined. This degree of reliability or probability of performing without malfunction or failure requires detailed observation and recording of many items for each round fired.

Proper functioning and resultant reliability can be determined only after a valid analysis of many observations have been made, results studied, and then evaluated by experienced artillerymen thoroughly familiar with all ammunition service test procedures.

3. REQUIRED EQUIPMENT

As required in the applicable commodity service test.

4. REFERENCES

- A. As indicated in the applicable commodity service tests.
- B. All Training Manuals and Technical Publications for the test ammunition or component.
- C. AMCP 706-110 through -114 Engineering Design Handbook, Experimental Statistics, sections I through V respectively.
- D. Simon, L. E. An Engineer Manual of Statistical Methods, John Wiley and Sons Inc.
- E. MTP 3-1-002 Confidence Intervals and Sample Size.

5. SCOPE

## 5.1 SUMMARY



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This Materiel Test Procedure describes the data and observations that must be recorded at the firing position and from observation posts, during direct and indirect firing missions, for the determination of ammunition functioning ability and reliability.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Ensure that all test personnel are familiar with all Training Manuals and Technical Publications pertaining to the ammunition or ammunition component being tested. Place special emphasis on functioning - what is normal and what is to be considered a malfunction.

b. To arrive at valid results, all firings must be done by average trained personnel using currently authorized cannon gunnery techniques.

NOTE: If special techniques are required for the test item, they should be limited to those described in the Training and Technical Publications issued with the maintenance package for the test item.

6.2 TEST CONDUCT

a. For every test round fired during the commodity service test and all related common tests, the following shall be determined and recorded:

- 1) Grid coordinate of gun from which the test ammunition is fired.
- 2) Meteorological data.
- 3) Powder temperature.
- 4) Muzzle velocity.
- 5) Gun settings.
- 6) Surveyed location of impact (if time fire or proximity fuzes are used, record height of burst).
- 7) Actual time of flight (use burst time indicator).

b. At the gun position observe, investigate, and record all details concerning any of the following:

- 1) Misfires
- 2) Cook-offs
- 3) Rounds not fired due to deficiency discovered upon inspection
- 4) Preparation delays
- 5) Hang fires
- 6) Any other malfunction not mentioned above

c. Observe, and record details concerning any crew error to errors

that might have affected ammunition functioning.

d. At the observation posts near the impact area, observe and record the following:

- 1) Malfunctions such as duds, low order bursts, early bursts, ground bursts when air bursts are expected and mine action with fuze "Quick".

NOTE: Explosive ordnance personnel shall examine duds and determine the cause of malfunction, if possible.

- 2) Odd sounds in projectile flight.

e. Record details concerning any observed ammunition functioning that fails to meet or exceeds the criteria listed in the QMR, SDR, or TC.

NOTE: Complete an Equipment Performance Report for each round that malfunctions, is not fired because of a deficiency, or fails to meet the stated requirements of the QMR, SDR or TC.

#### 6.3 TEST DATA

Record the following for each round fired during the commodity service test and all related common tests:

- a. Grid coordinate of gun.
- b. Meteorological data.
- c. Powder temperature in °F.
- d. Muzzle velocity in fps.
- e. Gun settings.
- f. Location of impact.
- g. Height of burst, if applicable.
- h. Occurrence of the following malfunctions and cause, if known:

- 1) Misfire
- 2) Cook-offs
- 3) Rounds not fired due to deficiency
- 4) Preparation delays
- 5) Hang fires
- 6) Other

- i. Crew errors observed that might affect ammunition functioning.
- j. Malfunctions on impact and cause, if known.
- k. Odd sounds in projectile flight.
- l. Details concerning ammunition functioning that fails to meet or exceeds the criteria listed in the QMR, SDR, or TC.

#### 6.4 DATA REDUCTION AND PRESENTATION

- a. Data reduction should consist of an analysis of each round fired.

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Initially the entire number of rounds fired can be divided into two groups; those rounds that functioned properly and within the limits prescribed by the QMR, SDR, or TC and those rounds that had some malfunction.

b. Present reliability data either in narrative form or in the form of a statistical confidence level, computed as outlined in MTP 3-1-002. Generally the narrative type is preferable for the service test report. This presentation states that so many rounds were fired, so many were observed to function normally, and so many were observed to malfunction. Numerically categorize the malfunction according to type as described in subparagraphs 6.2b and c.

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